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International
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A Cross-Sectional Analysis of Food Safety Knowledge and Practices among Restaurant Food Handlers employed in Bangladesh.

A PROJECT REPORT BY
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ID: 201-34-298

Submitted to the Department of Nutrition and Food Engineering in partial fulfillment of the requirements for a B.Sc. in Nutrition and Food Engineering.

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APPROVAL

This project report titled “**A Cross-Sectional Analysis of Food Safety Knowledge and Practices among Restaurant Food Handlers employed in Bangladesh.**”, submitted by Md. Fuad Hasan Pulok submission to the Daffodil International University Department of Nutrition and Food Engineering has been accepted as a partial fulfilment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and has received approval for its style and substance.

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Ms. Tasmia Tasnim**, Assistant Professor & Co-supervision **Md. Shamsur Rahman**, Lecturer (Senior Scale), Department of Nutrition and Food Engineering (NFE), Faculty of Allied Health Sciences, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

This research seeks to assess the knowledge and practices related to food safety among restaurant workers in Bangladesh. Globally, foodborne illnesses remain a major health issue, often stemming from poor food handling. In Bangladesh, where the restaurant sector is rapidly growing, ensuring food safety is vital to prevent foodborne disease outbreaks. To evaluate food safety awareness and practices, restaurant employees were surveyed using a questionnaire, and their food handling practices were directly observed. The data were analyzed using descriptive statistics and inferential analysis. Findings indicated that men had significantly less knowledge about food safety compared to women ($p = 0.002$). Better knowledge was associated with higher education and more experience. Employees in fast-food restaurants exhibited greater knowledge ($p = 0.000$). Knowledge, rather than training, significantly influenced responsibilities ($p = 0.000$). In terms of food safety practices, women demonstrated better practices than men ($p = 0.032$). Age, education, and experience did not significantly impact practices, while fast-food restaurants were observed to have the best practices ($p = 0.014$). Responsibilities and training did not have a significant effect on practices. The study reveals that food handlers have varying levels of food safety knowledge, with significant deficiencies in temperature control, personal hygiene, and prevention of cross-contamination. Additionally, the observed practices suggest that adherence to recommended food safety protocols is not optimal.

Keywords: Food safety knowledge, Restaurant food handlers, Foodborne illnesses, Cross-contamination.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Foodborne illnesses represent a significant global health challenge, with approximately 600 million cases annually resulting in 420,000 deaths worldwide (WHO, 2015). Improper food handling is a major contributor to these diseases, highlighting the critical need for food safety throughout the entire supply chain, from production to consumption. Within this context, food handlers, particularly those in restaurants and food service establishments, are essential as they directly affect the safety of the food served to consumers (Mian, 2018).

Bangladesh, a heavily populated country in South Asia, is experiencing rapid urbanization and economic development, leading to the growth of its restaurant sector. With more people opting to dine out, it is essential to uphold high food safety standards in restaurants to protect public health. However, foodborne diseases remain a major issue, with frequent outbreaks reported across the nation. Evaluating the food safety knowledge and practices of restaurant food handlers in Bangladesh is critical for identifying gaps and implementing targeted strategies to mitigate the risk of foodborne illnesses (Banna, 2022).

Although food safety practices have been studied in various global contexts, there is a lack of specific research on restaurant food handlers in Bangladesh. To address this gap, this cross-sectional analysis aims to thoroughly evaluate the food safety knowledge and practices of restaurant food handlers in Bangladesh. By investigating their compliance with food safety protocols and pinpointing areas needing improvement, this study intends to provide evidence-based interventions and policy recommendations to elevate food safety standards in the restaurant industry (Fosiul, 2019).

This study's importance goes beyond public health; it also impacts economic development and consumer confidence. Ensuring food safety safeguards the population's health and well-being and bolsters the reputation and sustainability of the restaurant industry. As consumers become more discerning about food safety and quality, establishments that prioritize these aspects are more likely to earn and retain customer trust and loyalty, thereby fostering the growth and competitiveness of the sector (Monica Gallo, 2020).

In this context, the study aims to enhance the existing literature on food safety by providing insights into the knowledge and practices of restaurant food handlers in Bangladesh. By identifying areas requiring improvement and proposing targeted interventions, this research endeavors to cultivate a culture of food safety and enhance public health outcomes within the country.

1.2 Objective

1. Evaluate the understanding of food safety principles among restaurant food handlers, focusing on aspects like temperature control, personal hygiene, cross-contamination prevention, and appropriate food handling techniques.
2. Investigate how well restaurant food handlers comply with recommended food safety protocols throughout food preparation, storage, and serving processes.
3. Identify any shortcomings and areas requiring improvement in food safety knowledge and practices among restaurant food handlers in Bangladesh.
4. Examine the correlation between food safety knowledge and practices among restaurant food handlers and demographic variables such as age, gender, educational attainment, and tenure in the food service sector.
5. Offer evidence-based suggestions for interventions and policy initiatives aimed at enhancing food safety standards within Bangladesh's restaurant industry. The objective is to decrease the occurrence of foodborne diseases and safeguard public health.

CHAPTER 2

LITERATURE REVIEW

2.1 Literature review

Sometime recently Nasser Abdullatif Al-Shabib's examination, a study was conducted among 87 nourishment handlers utilized at Lord Saud College, Riyadh, KSA, to assess their understanding, demeanor, and behaviors with respect to nourishment security. The comes about demonstrate that the larger part of these specialists, from assorted foundations, illustrate a solid get a handle on of individual cleanliness, foodborne sicknesses, and cross-contamination issues relevant to nourishment security. The think about underscores the commendable hones displayed by the nourishment handlers in terms of both nourishment and individual cleanliness. Eminently, demeanor develops as a noteworthy determinant of nourishment security, with nourishment handlers exhibiting positive states of mind, as prove by cruel scores of 80.76 ± 18.02 and a add up to cruel score of 2.69. The ponder distinguishes a essential positive relationship between information and demeanor ($r_s = 0.371$, $p < 0.05$), information and preparing ($r_s = 0.107$, $p < 0.05$), information and individual cleanliness ($r_s = 0.303$, $p < 0.05$), preparing and individual cleanliness ($r_s = 0.174$, $p < 0.05$), as well as demeanor and individual cleanliness ($r_s = 0.173$, $p < 0.05$). In spite of the fact that these relationships are statistically significant, their quality isn't especially strong. The investigate recommends that whereas the nourishment handlers for the most part display palatable information, states of mind, and hones, certain perspectives related to cleanliness, time administration, and temperature control require advance consideration. Persistent instructive activities and preparing programs are prescribed to reinforce the nourishment handlers' proficiency in zones that will require enhancement (Al-Shabib, 2016).

Taking after Oluwaseun Emmanuel ODIPE's inquire about, nourishment security developed as one of the best ten worldwide wellbeing dangers in 2019, with foodborne malady episodes posturing critical open wellbeing challenges, coming about in roughly 76 million sicknesses, 325,000 hospitalizations, and 5,000 passings yearly. Be that as it may, 20-40% of such ailments are ascribed to the utilization of sullied nourishment, with bukateria foundations as often as possible cited as essential sources of scattered and episode foodborne diseases, counting those related to water, sanitation, and cleanliness (WASH). This issue is especially articulated in creating countries due to predominant destitute nourishment dealing with and sanitation hones, insufficient and tokenistic nourishment security controls, frail administrative systems, constrained money related assets for contributing in more secure hardware, and deficiently instruction for nourishment handlers. This consider assesses the natural sanitation conditions of complexes advertising open 'Bukataria' administrations within the Iju region of Akure North Nearby Government Zone, Ondo State, South-West Nigeria. A purposive examining approach was utilized, and 36 respondents from 16 bukarias were overviewed between April 2013 and May 2013. The entire number of bukateria was gotten from the Natural Wellbeing Unit of Akure North Neighborhood Government, with proprietors and nourishment handlers chosen employing a lottery strategy from each chosen bukateria. A organized and pretested survey was created after checking on significant writing and counseling experts within the field to gather information. Investigation included frequencies, Chi-

square tests, and other rundown measurements to evaluate nourishment vendors' information of cleanliness and natural sanitation practices. The Chi-square tests ($P = 0.1, 0.01$) uncovered that respondents with higher levels of instruction (approximately 72%) and catering preparing (6%) illustrated way better information of nourishment cleanliness. Furthermore, comes about shown that whereas 61% of nourishment sellers did not utilize smocks, as it were approximately 39% of those who did were considered flawless. Besides, 75% of the bukateria had offices for securely putting away cooked nourishment, whereas 56% kept up clean kitchens and capacity ranges. Essentially, 31.3% of the bukateria were enough ventilated, with 75% keeping up clean feasting ranges. Besides, 46% had get to to proper sewage transfer strategies. All bukateria had get to to consumable water and an satisfactory deny transfer framework, with rodents and flies truant in 75% of the foundations gone by. This think about will altogether contribute to the advancement of suitable methodologies to upgrade administrative exercises for program arranging and assessment by natural wellbeing officers. Be that as it may, more endeavors are needed in steady supervision preparing, instruction, restorative screening for nourishment handlers, and checking to advance progress community well-being. These discoveries emphasize the need for focused on sanitation mediations in Bukateria foundations to address current inadequacies or need of advance (ODIPE, 2019).

A few time as of late conducting her consider, Larissa Tannus Rebouças endeavored an assessment in 2016 centering on the data levels, states of intellect, and sharpens of food handlers, as well as those of head chefs and administrators in motel eateries found in Salvador, Brazil. The data collection included interviews with 265 food handlers and 32 head chefs and chiefs. Besides, the consider evaluated the influence of having a nutritionist show inside the eateries. The revelations revealed that 88.0%, 96.6%, and 76.0% of food handlers shown fitting data, states of intellect, and sharpens concerning person cleanliness, independently. Be that because it may, certain goofs were celebrated, tallying the disillusionment to utilize disposable gloves when managing with or serving food (39.6%), tasting food with revealed hands (28.7%), and talking though managing with food (52.5%). Quantifiable examination did not reveal a basic connection between the data, states of intellect, and self-reported sharpens of the handlers. Be that because it may, there was a relationship between food handlers who point by point tall work fulfillment and those who outlined fitting sharpens. With regard to head chefs and executives, the comes around illustrated forbidden levels of data, in show disdain toward of 75% of respondents holding planning certificates in food security. A basic divide of respondents were ignorant of the sanctioning suitable in eateries (37.5%), and because it were 43.8% were recognizable with the endorsed temperature for food preservation in the midst of cooling. In any case, palatable sharpens to direct cross-contamination were observed. The closeness of a nutritionist inside the eateries unequivocally affected the adherence to current sanctioning in hotel eateries, as well as the participation of food handlers in planning sessions, in this way developing a positive culture among the handlers (Rebouças, 2016).

CHAPTER 3

MATERIALS AND METHODS

3. Methodology

3.1 Sampling procedure

A graphic, cross-sectional study was carried out among 300 eatery nourishment handlers chosen arbitrarily from different locales in Bangladesh. The think about included 65 quick nourishment eateries (with a reaction rate of 21.7%), 138 casual feasting foundations (with a reaction rate of 46%), 38 fine feasting foundations (with a reaction rate of 12.7%), 48 road nourishment merchants (with a reaction rate of 16%), and 11 other sorts of eateries (with a reaction rate of 3.7%). The reaction rates among members were 11.7% for chefs, 18.3% for aides, 30.7% for nourishment servers, 27.3% for cooks, and 12% for other parts, totaling 300 reactions.

3.2 Data collection

Information were assembled through face-to-face interviews utilizing a organized survey built based on existing writing. The survey, at first in English, was deciphered into Bengali amid information collection. The English-to-Bengali interpretation was carried out by a bilingual interpreter and cross-checked by an autonomous bilingual inquire about group part to guarantee exactness. To preserve consistency and minimize inclination, another autonomous bilingual inquire about staff part conducted a back-translation. Earlier to the most think about, the survey was pilot-tested on a haphazardly chosen test of meat handlers ($n = 10$) to approve its appropriateness, clarity, and term. Information collectors given a comprehensive clarification of the study's goals to all members and secured either composed assent from those able of perusing or verbal assent from illiterate participants. Each meet endured roughly 20–25 minutes. To preserve secrecy, participants' reactions were anonymized through survey coding.

3.3 Study variables and measures

A survey was adjusted from past inquire about ponders (Tegegne & Phyo, 2017; Ansari-Lari et al., 2010), with a few questions altered for significance. The survey comprised three fundamental areas: Statistic Characteristics (Portion 1): This area assembled data on participants' age, sexual orientation, instruction level, a long time of involvement as a nourishment handler, sort of eatery, and their part within the field. Nourishment Security Information Appraisal (Portion 2): Members were evaluated on their information of nourishment security through ten questions adjusted from a consider by (Gruenfeldova, Domijan, and Walsh, 2019). Questions secured themes such as nourishment planning and conservation, foodborne sicknesses, individual cleanliness, cross-contamination, and time and temperature control of nourishment. Each address advertised three reaction choices: genuine, wrong, or "I do not know." Redress reactions were granted one point, whereas inaccurate or "I do not know" reactions gotten zero focuses. Scores extended from to 10, with scores of 5 or over considered demonstrative of great information, and scores underneath 5 demonstrating destitute information. Nourishment Security Hone Evaluation (Portion 3): This segment tended to nourishment handlers' hones through eleven questions. Each address given five

reaction alternatives: never, once in a while, in some cases, frequently, and continuously. The questions centered on individual cleanliness, cross-contamination, foodborne maladies, microorganisms, and cleanliness hones. A five-point ordinal scale was utilized for assessment, with scores extending from to 44. For four particular questions, switch scoring was connected. Scores underneath 22 were categorized as destitute hones, whereas scores of 22 or higher were considered characteristic of a great level of hone.

3.6 Statistical Analysis

Information examination was performed utilizing SPSS computer program form 20.0 for Windows. Clear measurements were utilized to look at all perspectives of the consider, with factual centrality set at a p-value underneath 0.05, as built up by (Al-Shabib, 2016). Expressive insights were utilized to summarize both information levels and hones. Moreover, subgroup examination based on statistic variables was conducted, taking after the approach laid out by (Nisreen , 2019).

CHAPTER 4

RESULT & DISCUSSIONS

Table 1- Socio-demographic characteristics of study participants (N = 300).

Variable	Categories	Frequency	Percentage
Gender	Male	259	86.3
	Female	41	13.7
Age (years)	<18	10	3.3
	18-24	66	22.0
	25-34	89	29.7
	35-44	103	34.3
	>44	32	10.7
Education level	Illiterate	57	19.0
	Primary School	110	36.7
	High School Graduate	82	27.3
	Some College/ Technical Training	27	9.0
	Bachelor's degree and higher	24	8.0
Year of experience as a food handler	<1	23	7.7
	1-2	87	29.0
	3-5	108	36.0
	>5	82	27.3
Type of Working place	Fast food restaurant	65	21.7
	Casual Dining	138	46
	Fine Dining	38	12.7
	Street food vendors	48	16.0
	Others	11	3.7
Type of responsibility	Chef	35	11.7
	Helper	55	18.3
	Food Server	92	30.7
	Cook	82	27.3
	Others	36	12
Food Safety Training	Yes	5	1.7
	No	295	98.3

Table 1 presents the socio-demographic characteristics of the consider members (N = 300). The information shows that the larger part of members were male, bookkeeping for 86.3% of the whole, whereas females spoken to the remaining extent at 13.7%. We got the result for Age (years) Participants were distributed across various age groups, with the largest fraction falling within the

35-44 years range (34.3%), followed by 25-34 years (29.7%), 18-24 years (22.0%), >44 years (10.7%), and <18 years (3.3%). Similar findings were found in Saudi Arabia (Al-Shabib, et al.), with 55.2% matured between 26 and 35 a long time. From add up to respondents overviewed, as it were 1.1% were matured between 45 and 55 a long time. In this study responded level of Education, Primary school education was the most common (36.7%), followed by high school graduate (27.3%), illiterate (19%), some college/technical training (9%), and bachelor's degree and higher (8%). The respondents were experiences as a food handler, most participants had 3-5 years of experience (36%), followed by 1-2 years (29%), >5 years (27%), and <1 year (7.7%). Essentially, (Halim-Lim, et al., 2023), nitty dirty that their acknowledgments uncovered that respondents since it was female, with a coldblooded age of 35 a long time. Instruction levels moved with 52.8% of the individuals having a to begin with to third review and 30.9% had include up to or inadequately partner school level.

In responded for working place, Casual dining was the most common workplace (46%), followed by fast food restaurants (21.7%), street food vendors (16%), fine dining restaurants (12.7%), and other locations (3.7%). The respondents were specific responsibility, we get the result for Chef (11.7%) respondents, Helper (18.3%), Food Server (30.7%), Cook (27.3%) and the Others (12.0%) respondents respectively. And also in respondents we got the result for Food safety training, the respondents 1.7% previously complete food safety training programed while 98.3% were don't take the any training program. Similar findings were reported in Brazil (Rebouças et al., 2017), where a majority of respondents attended training sessions, while 17% never took part in any training related to food safety. However, among the handlers, 44.0% stated that they had not participated in any training during the specified period.

Table -2. Summary of questions and responses for assessment of food safety knowledge of food handlers (N = 300).

Statements	Responses, n (%)		
	True	False	Don't Know
Washing hands with soap and water before work reduces the risk of food contamination.	176 (58.7)	5 (1.7)	119 (39.7)
Wearing hairnets, gloves, and masks is not important for food safety.	54 (18)	214 (71.3)	32 (10.7)
Eating and drinking in the workplace is not a risk for food contamination.	48 (16)	73 (24.3)	179 (59.7)
Food should be cooked to a minimum internal temperature of 74°C to kill harmful bacteria.	174 (58)	8 (2.7)	118 (39.3)
A food handler with an infectious disease should take leave and should not work on food preparation activities	224 (74.7)	6 (2)	70 (23.3)
Raw meat can be stored with ready-to-eat foods in the refrigerator together.	78 (26)	36 (12)	186 (62)
Leftovers should be refrigerated within 2 hours of being cooked.	220 (73.3)	14 (4.7)	66 (22)
It's safe to use the same cutting board for vegetables and raw meat as long as you wash it between uses.	64 (21.3)	56 (18.7)	180 (60)
Jewelry should not be worn by food handlers when preparing food, as they can harbor dirt and bacteria.	170 (56.7)	15 (5)	115 (38.3)
The danger zone for food temperatures is between 40°F (4.4°C) and 140°F (60°C).	20 (6.7)	13 (4.3)	267 (89)

The people Clearly cautious (58.7%) of the centrality of hand washing but still imperfect (39.7%). They respondents were Confounded judgments (71.3%) generally the significance of wearing hairnets, gloves, and covers for nourishment security. So as well, we found in Ireland (Gruenfeldovaa, et al., 2019), 39% of people were insensible that expendable gloves can be a potential cause of corruption, in appear despise toward of the reality that 86tailed to know that hands got to be washed earlier to putting on gloves and the another we found in Jordan (Osaili, et al., 2013), by and large 82lieved that touching a clean counter requires cleaning of the hands. Less than the third of the scholars (32%) knew the term that need to be went through within the middle of washing the hands. In respondents were require of understanding (59.7%) about the dangers of eating, and drinking at work. Since it were a minority of respondents (16%) accurately recognize

that eating and drinking interior the work environment posture a chance for nourishment defilement. Comparative comes around have been point by point in past considers nearly by (Al-Kandari, et al., 2019), Most of the respondents were not wearing beautifications (86.1%), smoking or eating (90.8%) within the middle of nourishment course of activity.

The people were respondents (58%) of revise cooking temperature (74°C). Agreeable confirmation (74.7%) of conventions for nourishment handlers with capable afflictions. In respondents were require of understanding 23.3out the nourishment handler with an capable ailment have to be be take take off and go without from working on nourishment course of activity works out. The individuals were compelled mindfulness (26%) of the dangers related with putting missing grungy meat with ready-to-eat nourishments. respondents were due to information 12out that the harsh meat got to be not be put absent with ready-to-eat nourishments interior the ice chest. Completely mindfulness (73.3%) of the got to be rapidly guarantee remains interior the ice chest. The people of respondents require of understanding (22%) about the centrality of refrigerating scraps insides 2 hours of being cooked to evade nourishment crumbling. Essentially, we found the result Since it were 67frost set meat and poultry interior the cooler and 24 and 4% of the scholars utilize water or microwave for defrosting, only. In appear hate toward of the reality that more than 90% of the scholars had thermometer or comparable interior the ice chest and cooler, less than 50% knew the secure operation temperatures of the cooler and cooler (Osaili, et al., 2013; Jianu & Chiş, 2012) point by point that since it was 44% of nourishment handlers knew that harsh and organized to eat nourishments must be put missing on limited racks. (Bolton, et al., 2008) recorded that 30% and 43% of head chefs and catering bosses in Ireland store grungy meat interior the foot rack interior the cooler and in confined ice chest. The Respondents were perplexity (60%) around the security of utilizing the same cutting board for vegetables and unrefined meat. The minority of respondents (21.3%) precisely recognize that it isn't secure to utilize the same cutting board for vegetables and grungy meat, indeed in case washed between livelihoods. Basically, our revelations the result greater parcel of the met Saudi ladies nitty dirty utilizing isolated cutting sheets for grungy and cooked nourishments or utilizing the same after fitting cleaning, a few of them nitty abrasive that they don't know that utilizing the same awfully cleaned cutting sheets can lead to nourishment harming (Farahat, et al., 2015). Awesome understanding (56.7%) of the importance of keeping up a key partitioned from wearing gems when planning food. The respondents (38.3%) they were do not have information that precious stones ought to be not be worn by nourishment handlers due to the chance of harboring soil and life forms, (Acikel, et al., 2008) point by point that changed truly fundamentally post-training was towards 'wearing jewels and watches'. Pre-training, 50% of the bunches communicated that they did not wear embellishments or observes and this expanded to 80% post-training. Some of rate of respondents (6.7%) absolutely recognize the temperature danger zone for nourishment, which is between 40°F (4.4°C) and 140°F (60°C). The greater parcel either don't know or erroneously reacted. So moreover, our finding because it was 53.1% of respondents knew how utilize the bain marie, and to guarantee that the nourishment is at the fitting temperature, 62.5% said to utilize the thermometer particularly in nourishment, whereas 12.5% of them didn't know how to screen this temperature (Rebouças, et al., 2017).

Table-3 Summary of questions and responses for assessment of food safety Practice of food handlers (N = 300).

Questions	Responses, n (%)				
	Never	Rarely	Sometime	Often	Always
Do you consume food or beverages inside food processing areas?	122(40.7)	108 (36.30)	61 (20.3)	2 (0.7)	7 (2.3)
Do you smoke inside food processing areas?	206 (68.7)	52 (17.3)	38 (12.7)	1 (0.3)	3 (1)
Do you wash your hands before and after the use of gloves?	1 (0.3)	6 (2)	25 (8.3)	48 (16)	220 (73.3)
Do you wash your hands after handling waste or garbage?	1 (0.3)	3 (1)	11 (3.7)	48 (16)	237 (79.0)
Do you use sanitation to wash hands after using toilet?	0 (0)	0 (0)	0 (0)	0 (0)	300 (100)
Do you wash your hands after smoking, sneezing, or coughing?	1 (0.3)	1 (0.3)	4 (1.3)	33 (11)	261 (87)
Do you use a hairnet or a cap while working for food safety?	124 (41.3)	53 (17.7)	82 (27.3)	12 (4)	29 (9.7)
Do you use rings, watches, or necklaces while you process the food?	112 937.3)	35 (11.7)	139 (46.3)	7 (2.3)	7 (2.3)
Do you follow the dress code when you process the food?	179 (59.7)	74 (24.7)	36 (12)	2 (0.7)	9 (3)
Do you properly clean all equipment?	2 (.7)	3 (1)	10 (3.3)	22 (7.3)	263 (87.7)
Do you handle money while processing food?	147 (49)	51 (17)	52 (17.3)	20 (6.7)	30 (10)

The participants were 40.7% of responded never consuming food or beverages inside food processing areas, indicating a good practice. 36.3% respondents rarely doing so, suggesting

occasional lapses in adherence to the practice. The inspections were 20.3% responded consuming food or beverages sometimes, indicating intermittent non-compliance. Because it was 0.7% tailed routinely doing so, proposing exceptional events of visit non-compliance and A vital allocate 2.3% respondents were eating up food or refreshments insides food taking care of ranges, appearing a require for medicinal action. Also we finding the result in (Al-Shabib, et al.) because it was 19.5% respondents eat up food or refreshments insides food taking care of ranges, 80.5% responded never using food or refreshments insides food dealing with ranges.

Although most restaurants employed 68.7% of respondents reported never smoking inside food processing areas, indicating a good practice, 12.7% responded smoking sometimes, indicating intermittent non-compliance, 1% reported always smoking inside food processing areas, indicating a need for corrective action. We observed 17.3% respondents rarely doing so, suggesting occasional lapses in adherence to the practice. It was found that Only 0.3% reported often smoking inside food processing areas, suggesting rare instances of frequent non-compliance. (Osaili, et al., 2013) reported that the results Smoking would affect food safety only 8.1% respondents respectively.

The participants were 73.3% reported always washing their hands, indicating a strong adherence to this practice, while 0.3% of respondents reported never washing their hands before and after using gloves, indicating good compliance. The Some was reported 2% rarely doing so, suggesting occasional lapses and 8.3% reported washing their hands sometimes, indicating intermittent compliance and the others 16% reported often washing their hands, indicating a fairly consistent practice. In relation to washing hands after handling waste or garbage it was reported 0.3% of respondents reported never washing their hands after handling waste or garbage, indicating good compliance, 1% reported rarely doing so, suggesting occasional lapses. The bigger portion of respondents know they must 79tailed persistently washing their hands, illustrating a strong adherence to this sharpen. A collection of sharpen was point by point by heads and chiefs to food course of action. It was observed that a couple of eateries utilized 3.7tailed washing their hands in a few cases, illustrating sporadic compliance, while 16tailed frequently washing their hands, illustrating a conventionally dependable sharpen. The all respondents point by point ceaselessly utilizing sanitation to wash hands after utilizing the can, showing widespread compliance with this fundamental sharpen. To assist inside the washing hands after smoking, sneezing, or hacking, the individuals 0.3% of respondents nitty gritty never washing their hands after smoking, sneezing, or hacking, appearing awesome compliance, 0.3tailed once in a whereas doing so, proposing irregular slips. A number of individuals were 1.3tailed washing their hands a few of the time, appearing sporadic compliance, 11tailed as often as possible washing their hands, illustrating a modestly dependable sharpen, though 87tailed ceaselessly washing their hands, appearing a strong adherence to this sharpen. Moreover, our finding result in turkey (Bas & Kivanc, 2006) most washed their hands a few time as of late putting them on 8.1% and after clearing them 3.8%, Another finding the result in Jordan (Osaili, et al., 2013) Over 90% of respondents may recognize when to wash their hands and knew that gloves got to be worn a few time as of late touching ready-

to-eat nourishments. In any case, around 82% believed that touching a clean counter requires handwashing. Less than a third of the respondents (32%) knew the correct term for handwashing.

Restaurants employed 41.3% of respondents reported never using a hairnet or cap while working, indicating a significant portion of non-compliance, 17.7% reported rarely doing so, suggesting occasional lapses, 27.3% reported sometimes using a hairnet or cap, indicating intermittent compliance, 4% reported often using a hairnet or cap, indicating a fairly consistent practice and 9.7% responded always using a hairnet or cap, indicating a need for corrective action to improve compliance.

The participants were asked to use verities rings, watches, or necklaces while you process the food 37.3% of respondents reported never using rings, watches, or necklaces while processing food, indicating a significant portion of non-compliance, 11.7% reported rarely doing so, suggesting occasional lapses, 46.3% reported sometimes using such accessories, indicating intermittent compliance. The same was observed for rings, watches, or necklaces most respondents 2.3% reported often using such accessories, indicating a fairly consistent practice. It was found that only 2.3% reported always using such accessories, indicating a need for corrective action to improve compliance. Comparable comes about were found by (Al-Shabib et al.), who detailed that 96.6% of members kept up secure hones such as wearing regalia and caps. Moreover, 95.4% washed their hands after smoking, hacking, or sniffing, and 75.9% evacuated individual things like observes, rings, and adornments to anticipate nourishment defilement. In Ankara, Turkey, (Çakıroflu and Uçar, 2008) detailed that 82.9% of staff wore caps, covers, and gloves whereas dealing with nourishment, and 84.2% did not wear gems amid nourishment planning.

The inspections were dress code when processing the food, Participants were respondents 59.7% of reported never following the dress code when processing food, indicating a significant portion of non-compliance, 24.7% reported rarely doing so, suggesting occasional lapses. It was observed 12% responded sometimes following the dress code, indicating intermittent compliance, 0.7% reported often following the dress code, suggesting rare instances of frequent compliance, 3% reported always following the dress code, indicating a need for corrective action to improve compliance.

The inspection for cleaning all equipment it was reported only 0.7% of respondents never properly cleaning all equipment, indicating good compliance, 1% reported rarely doing so, suggesting occasional lapses, 3.3% reported sometimes properly cleaning all equipment, indicating intermittent compliance, 7.3% reported often properly cleaning all equipment, indicating a fairly consistent practice, 87.7% responded always properly cleaning all equipment, indicating a strong adherence to this practice. (Çakıroflu and Uçar, 2008) detailed that dishonorable and wasteful cleaning hones, stemming from a need of information around cleanliness, lead to nourishment defilement.

Finally, it was verified that 49% of respondents reported never handling money while processing food, indicating a significant portion of non-compliance, 17% reported rarely doing so, suggesting occasional lapses, 17.3% reported sometimes handling money, indicating intermittent compliance, 6.7% reported often handling money, indicating a fairly consistent practice, while 10% reported always handling money, indicating a need for corrective action to improve compliance. (Rebouças, et al., 2017) reported that Only 73.9% of respondents positively adhered to avoiding behaviors that can contaminate food, such as smoking, talking, singing, eating, drinking, sneezing, coughing, handling money, or other similar activities, while 26.1% did not.

Table 4: Factors associated with the food safety knowledge of food handlers (N = 300).

Variables	Food safety knowledge level		P value
	Good	Poor	
Gender			
Male	94 (36.3)	165 (63.7)	0.002*
Female	26 (63.40)	15(63.6)	
Age (years)			
<18	3 (30.0)	7(70.0)	0.169*
18-24	21 (31.8)	45 (68.2)	
25-34	39 (43.8)	50 (56.2)	
35-44	39(37.9)	64 (62.1)	
>44	18 (56.3)	14 (43.8)	
Education level			
Illiterate	15 (26.3)	42 (73.7)	0.000*
Primary School	35 (31.8)	75 (68.2)	
High School Graduate	38 (46.3)	44 (53.7)	
Some College/ Technical Training	8 (29.6)	19 (70.4)	
Bachelor's degree and higher	24 (100)	0 (0.0)	
Experiences			
<1 year	5 (21.7)	18 (78.3)	0.037*
1-2 years	30 (34.5)	57 (65.5)	
3-5 years	43 (39.8)	65 (60.2)	
>5 Years	42 (51.2)	40 (48.8)	
Type of Working place			
Fast food restaurant	36 (55.4)	29 (44.6)	0.000*
Casual Dining	61 (44.2)	77 (55.8)	
Fine Dining	15 (39.5)	23 (60.5)	
Street food vendors	7 (14.6)	41 (85.4)	
Others	1 (9.1)	10 (90.9)	
Responsibility			
Chef	26 (74.3)	9 (25.7)	0.000*
Helper	21 (38.2)	34 (61.8)	
Food Server	28 (30.4)	64 (69.6)	
Cook	32 (39.0)	50 (61.0)	
Others	13 (36.1)	23 (63.9)	
Food Safety Training			
Yes	2 (40.0)	3 (60.0)	1.00
No	118 (40.0)	177 (60.0)	

The study examined food safety knowledge levels among male and female food handlers. Among male respondents, 36.3% had good knowledge, while 63.7% had poor knowledge. For female respondents, 63.4% had good knowledge, while 36.6% had poor knowledge. Men exhibited lower food safety knowledge compared to women ($p = 0.002$). Although variations in food safety knowledge were observed across different age groups, none were statistically significant. Notably, individuals aged over 44 had 56.3% good knowledge, indicating areas for further investigation. The differences between age groups were not statistically significant ($p = 0.169$). Education level significantly influenced food safety knowledge, with 100% of those with Bachelor's degrees or higher showing good knowledge, contrasting sharply with only 26.3% of those who were illiterate. Primary and high school graduates also displayed significant differences in knowledge levels. Higher education was associated with better food safety knowledge, with illiterate individuals having the lowest knowledge ($p = 0.000$). Experience also played a significant role in food safety knowledge. Those with over five years of experience showed a higher percentage of good knowledge at 51.2%, indicating that experience positively impacts knowledge acquisition ($p = 0.037$). The type of workplace significantly influenced food safety knowledge. Fine dining establishments had the highest rate of good knowledge (39.5%), while street food vendors had the lowest rate (14.6%), highlighting potential disparities in training and education across different work environments. Fast food restaurants demonstrated significantly better food safety knowledge compared to street food vendors and other types of restaurants ($p = 0.000$). There were significant differences in food safety knowledge based on job roles, with chefs exhibiting the highest proportion of good knowledge (74.3%), underscoring the importance of leadership roles in ensuring adherence to food safety practices. Those with greater responsibilities, such as chefs, generally had better food safety knowledge ($p = 0.000$). Interestingly, no significant difference in food safety knowledge was found between those who received training and those who did not, suggesting a potential gap in the effectiveness of current training programs or the need for more comprehensive training initiatives ($p = 1.00$). The study highlights the importance of factors such as education, experience, workplace, and job responsibilities in influencing food safety knowledge among handlers. It underscores the need for targeted training and intervention programs tailored to specific demographic and work settings to improve food safety practices.

So also, discoveries from a ponder in Pakistan (Ahmed, et al., 2021) shown no noteworthy affiliation between "age" and the nourishment security information (FSK) of nourishment handlers ($p = 0.058$). Be that as it may, all other statistic characteristics appeared a critical affiliation with FSK ($p < 0.05$). A chi-square test looking at the relationship between member socioeconomics and their nourishment security demeanors (FSA) uncovered that "age" and "sexual orientation" were not essentially connected with FSA ($p = 0.052$ and $p = 0.161$, individually). In differentiate, other statistic variables (instruction level, proficient category, current work residency, and work encounter) shown critical affiliations with FSA ($p < 0.05$). Furthermore, the chi-square test demonstrated that all statistic factors, but for sexual orientation, appeared critical relationships with nourishment security hones (FSP).

In Ethiopia, a think about by (Alemayehu et al., 2021) found that nourishment handlers without any formal instruction were 77.0% less likely to have great nourishment security information

compared to those who had completed auxiliary instruction (AOR = 0.23, 95% CI = 0.14–0.57). Additionally, those with as it were essential instruction were 73.0% less likely to have great nourishment security information compared to those with auxiliary instruction or higher (AOR = 0.27, 95% CI = 0.09–0.45). Prepared nourishment handlers were five times more likely to have great nourishment security information compared to untrained handlers (AOR:5.13, 95% CI=3.57–7.82). Nourishment handlers with a favorable state of mind towards nourishment security had about three times higher chances of having great information of nourishment security compared to those with an unfavorable state of mind (AOR = 2.54; 95% CI:1.52–4.25).

In a nourishment security overview conducted in Brazil by (Rebouças et al., 2017), it was found that whereas self-reported hones of nourishment handlers were for the most part satisfactory, 91.3% did not clean their hands habitually sufficient. Numerous lodgings (54) needed assets for great cleanliness hones, and the nearness of a nutritionist was altogether related with superior cleanliness hones ($p = 0.014$; $p = 0.034$). Bivariate examination too appeared a noteworthy affiliation ($p < 0.05$) between nourishment handlers' fulfillment with workload within the "assurance gather" lodgings ($p = 0.000$).

Table 5: Factors associated with the food safety practice of food handlers (N = 300).

Variables	Food safety knowledge level		P value
	Good	Poor	
Gender			
Male	34 (13.1)	225 (86.9)	0.032*
Female	11(26.8)	30 (73.2)	
Age (years)			
<18	2(20.0)	8 (80.0)	0.888
18-24	10 (15.2)	56 (84.8)	
25-34	14 (15.7)	75 (84.3)	
35-44	16 (15.5)	87 (84.5)	
>44	3 (9.4)	29 (90.6)	
Education level			
Illiterate	9 (15.8)	48 (84.2)	0.178
Primary School	16 (14.5)	94 (85.5)	
High School Graduate	15 (18.3)	67 (81.7)	
Some College/ Technical Training	5 (18.5)	22 (81.5)	
Bachelor's degree and higher	0 (0.0)	24 (100.0)	
Experiences (years)			
<1	4 (17.4)	19 (82.6)	0.527
1-2	9 (10.3)	78 (89.7)	
3-5	18 (16.7)	90 (83.3)	
>5	14 (17.1)	68 (82.9)	
Type of Working place			
Fast food restaurant	10 (15.4)	55 (84.6)	0.014*
Casual Dining	27 (19.6)	111 (80.4)	
Fine Dining	7 (18.4)	31 (81.6)	
Street food vendors	1 (2.1)	47 (97.9)	
Others	0 (0.0)	11 (100.0)	
Responsibility			
Chef	3 (8.6)	32 (91.4)	0.764
Helper	8 (14.5)	47 (85.5)	
Food Server	17 (18.5)	75 (81.5)	
Cook	12 (14.6)	70 (85.4)	
Others	5 (13.9)	31 (86.1)	
Food Safety Training			
Yes	1 (20.0)	4 (80.0)	1.000
No	44 (14.9)	251 (85.1)	
Food Safety Knowledge			
Good	15 (12.5)	105 (87.5)	0.318
Poor	30 (16.7)	150 (83.3)	

There's a factually noteworthy affiliation ($p = 0.032$) between sexual orientation and nourishment safety knowledge, with the next rate of females (26.8%) illustrating great nourishment security information compared to guys (13.1%). Participants' ages extended from 18 to 44, and there was no noteworthy contrast in nourishment security hones over distinctive age bunches ($p = 0.888$). Essentially, no critical contrasts in nourishment security hones were found between members with changing instruction levels ($p = 0.178$) or distinctive a long time of encounter ($p = 0.527$). Members worked in different sorts of foundations such as quick nourishment eateries, casual eating, fine feasting, road nourishment sellers, and others. Nourishment handlers in quick nourishment eateries shown way better nourishment security hones than those in road nourishment merchants and other sorts of foundations ($p = 0.014$). Participants' parts included chefs, partners, nourishment servers, cooks, and others, but there were no noteworthy contrasts in nourishment security hones based on proficient obligations ($p = 0.764$).

In general, 20.0% of members had great nourishment security information, whereas 80.0% had destitute information. The nearness or nonattendance of nourishment security preparing did not altogether influence nourishment security hones ($p = 1.000$). As it were 12.5% menstruated great nourishment security hones, whereas 87.5% had destitute hones. The level of nourishment security information did not essentially affect nourishment safety practices ($p = 0.318$). Comparative discoveries from Bangladesh (Banna et al., 2021) demonstrated that the chances of having great nourishment security hones were 8.5 times higher among respondents who worked for 8 or more hours per day compared to those who worked less than 8 hours (AOR = 8.44, 95% CI 3.11–22.91). Moreover, respondents with great nourishment security information were 5.7 times more likely to show great hones (AOR = 5.68, 95% CI 2.33–13.87). (Asmawi et al., 2018) detailed critical affiliations between information and states of mind ($\chi^2 = 5.103$, $p = 0.024$), states of mind and hones ($\chi^2 = 33.751$, $p < 0.001$), and information and hones ($\chi^2 = 3.910$, $p = 0.049$).

In a ponder by (Bou-Mitri et al., 2018), nourishment handlers in government and non-university-affiliated healing centers scored higher in information (71.3% and 60.5%, individually). Those in university-affiliated healing centers were essentially more likely to have positive states of mind compared to those in non-affiliated clinics (93.3% vs. 82.1%, $p < 0.001$). In general, Information, Demeanor, and Hone (KAP) scores were higher among respondents in government clinics (82.4%) compared to private clinics (74.7%, $p = 0.002$). Age, instruction level, and clinic area did not altogether influence information, states of mind, hones, or overall KAP scores.

In rundown, sexual orientation and sort of working environment may impact nourishment security hones among nourishment handlers, whereas age, instruction, involvement, work obligations, nourishment security preparing, and nourishment security information level don't have a noteworthy affect.

CHAPTER 5

CONCLUSIONS

5.1 Conclusion

This study offers profitable experiences into the nourishment security information and practices of eatery nourishment handlers in Bangladesh. It concluded that whereas nourishment handlers for the most part have great information levels and self-reported practices, their understanding of steps to avoid irresistible infections and the threat zone for nourishment temperatures was unsuitable. In any case, useful practices, such as adherence to handwashing, were detailed. The study recognized critical discoveries through a comprehensive survey of nourishment security information and watched practices. It uncovered shifting levels of understanding among eatery nourishment handlers, with striking holes in ranges such as temperature control, sanitation, cleanliness, individual cleanliness, and contamination anticipation (Garg & Sharma, 2021). In spite of the significance of these standards, the discoveries highlight the require for focused on instruction and preparing programs to improve nourishment handlers' abilities in Bangladesh.

Moreover, the watched practices shown problematic compliance with prescribed nourishment security methods (Jerry, 2023). Occasions of destitute nourishment dealing with, insufficient cleanliness measures, and deficiently temperature observing were recorded, underscoring the require for enhancements in nourishment security measures at eateries (Liggans et al., 2019). To upgrade nourishment security benchmarks within the eatery industry in Bangladesh, a few proposals were proposed. These incorporate creating and executing comprehensive preparing programs for nourishment handlers, fortifying authorization of nourishment security controls, and advancing a culture of nourishment security inside supply offices (Rebouças et al., 2017).

By and large, this study contributes to continuous endeavors to progress nourishment security information and practices in Bangladesh. By tending to the recognized crevices and executing evidence-based mediations, partners can guarantee that eatery nourishment handlers have the essential information and aptitudes to preserve tall benchmarks of nourishment security, subsequently decreasing the frequency of foodborne ailment and ensuring customer wellbeing.

5.2 Learning Outcome

1. Individuals will choose up a comprehensive understanding of the current food security data and sharpens among restaurant food handlers in Bangladesh.
2. They will be able to recognize key ranges of upgrade in food security instruction and planning programs for food handlers.
3. Make strategies to move forward food security sharpens in restaurant settings to soothe the danger of foodborne ailments.
4. Recognizing potential gaps and zones for centered on intervention to move forward by and large food security benchmarks.

CHAPTER 6

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Appendix

❖ Ethical Approval letter

25/05/2024

The Head

Department of Nutrition and Food Engineering
Daffodil International University
Daffodil Smart City, Birulia, Savar, Dhaka 1216, Bangladesh

Subject: Ethical Approval of Research Study

Dear Sir,

With due regards, I am Md. Fuad Hasan Pulok, a student of the 201 batch, wish to submit the project titled "A Cross-Sectional Analysis of Food Safety Knowledge and Practices among Restaurant Food Handlers Employed in Bangladesh." for ethical clearance.

I request you to kindly consider the project for review by the Ethical Committee. I shall be highly obliged for the same.

Kindly find attached the required documents regarding the project.

Sincerely,

Md. Fuad Hasan Pulok
Id: 201-34-298

❖ Questionnaires

Part 1

1. Name:

2. Gender:

Male

Female

3. Age:

- a) Under 18
- b) 18-24
- c) 25-34
- d) 35-44
- e) Above 44

4. Education Level:

- a) Illiterate
- b) Primary school
- c) High school graduate
- d) Some college/Technical training
- e) Bachelor's degree and higher

5. Years of Experience as a Food Handler:

- a) Less than 1
- b) 1-2 years
- c) 3- 5 years
- d) More than 5 years

6. Type of Restaurant:

- a) Fast Food
- b) Casual Dining
- c) Fine Dining
- d) Street Food Vendor
- e) Other

7. Field of Responsibility

- a) Chef
- b) Helper
- c) Food server
- d) Cook
- e) Other

8. Food safety training

- a) Yes
- b) No

Part 2: Food Safety Practices.

9. Do you consume food or beverages inside food processing areas?

- c) Never
- d) Rarely
- e) Sometime
- f) Often
- g) Always

10. Do you smoke inside food processing areas?

- a. Never
- b. Rarely
- c. Sometime
- d. Often
- e. Always

11. Do you wash your hands before and after the use of gloves?

- a. Never
- b. Rarely
- c. Sometime
- d. Often
- e. Always

12. Do you wash your hands after handling waste/garbage?

- a. Never
- b. Rarely
- c. Sometime
- d. Often
- e. Always

13. Do you use sanitation for wash hands after using the toilet?

- a. Never
- b. Rarely
- c. Sometime
- d. Often
- e. Always

14. Do you wash your hands after smoking, sneezing or coughing?
- Never
 - Rarely
 - Sometime
 - Often
 - Always
15. Do you use a hairnet or a cap while working for food safety?
- Never
 - Rarely
 - Sometime
 - Often
 - Always
16. Do you use rings, watches, and necklaces while you process the food?
- Never
 - Rarely
 - Sometime
 - Often
 - Always
17. Do you use a dress court when you process the food?
- Never
 - Rarely
 - Sometime
 - Often
 - Always
18. Do you properly clean all equipment?
- Never
 - Rarely
 - Sometime
 - Often
 - Always
19. Do you handle money while processing food?
- Never
 - Rarely
 - Sometime
 - Often
 - Always

Part 3: Food Safety Knowledge

20. Washing hands with soap and water before work reduces the risk of food contamination.
- True
 - False
 - don't know
21. Wearing hairnets, gloves, and masks is not important for food safety.
- True
 - False
 - Don't Know
22. Eating and drinking in the work place do not risk of food contamination.
- True
 - False
 - Don't Know
23. Food should be cooked to a minimum internal temperature of 74°C to kill harmful bacteria.
- True
 - False
 - Don't Know
24. A food handler with an infectious disease should take leave and should not work on food preparation activity.
- True
 - False
 - Don't Know
25. Raw meat cab be stored with ready-to-eat foods in the refrigerator together.
- True
 - False
 - Don't Know
26. Foodborne diseases can be prevented and controlled by good hygiene practices.
- True
 - False
 - Don't Know

- 27. Leftovers should be refrigerated within 2 hours of being cooked.**
- a. True
 - b. False
 - c. Don't Know
- 28. It's safe to use the same cutting board for vegetables and raw meat as long as you wash it between uses.**
- a. True
 - b. False
 - c. Don't Know
- 29. Jewels should not be worn by food handlers when preparing food, as they can harbor dirt and bacteria.**
- a. True
 - b. False
 - c. Don't Know
- 30. The danger zone for food temperatures is between 40°F (4.4°C) and 140°F (60°C).**
- a. True
 - b. False
 - c. Don't know

❖ **Synopsis of the proposed research project**

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2. ID: 201-34-298

3. Project Title: A Cross-Sectional Analysis of Food Safety Knowledge & Practices among Restaurant FoodHandlers employed in Bangladesh.

4. Background:

Bangladesh has experienced significant growth in its restaurant industry in recent years. With this expansion, ensuring food safety is crucial to prevent foodborne illnesses. Restaurant food handlers play a vital role in maintaining food safety.

5. Significance:

Limited studies have comprehensively assessed food safety knowledge and practices among restaurant food handlers in Bangladesh. Understanding the current state is essential for developing targeted interventions to improve food safety.

6. Objectives:

- a) To assess the level of food safety knowledge among restaurant food handlers in Bangladesh.
- b) To evaluate the food handling practices employed by these individuals.
- c) To identify potential areas for improvement in food safety training programs.

7. Literature Review:

This study aimed to assess the knowledge level, attitudes and practices of food handlers, and knowledge and practices of head chefs and managers in hotels' restaurants of Salvador, Brazil. Data collection was done through the application of interviews with 265 food handlers and with 32 head chefs and managers. In addition, the influence of the presence of nutritionist in restaurants was evaluated. The results showed that 88.0%, 96.6% and 76.0% of handlers had knowledge, attitudes and practices appropriate for personal hygiene, respectively. However, some errors were

observed such as the non-use of disposable gloves when handling or distributing food (39.6%), tasting food with their hands (28.7%), and usually talking while handling food (52.5%). Statistical analysis did not indicate a significant association between the knowledge, attitudes and self-reported practices by handlers. However, it was found association between handlers that presented good satisfaction with the job and handlers that introduced appropriate practices. Regarding to chefs and managers, the results indicate that the knowledge was unsatisfactory,

even 75% of respondents have training certificate in food safety. A significant percentage of respondents were unaware of the legislation adopted in restaurants (37.5%), and only 43.8% of them knew the recommended cooling temperature for food preservation. However, adequate practices to reduce cross-contamination was observed. Still, the presence of the nutritionist in restaurants influenced positively on the adoption of the current legislation in hotels' restaurants, as well as in the participation of the handlers in training, showing in this way the creation of a positive culture among the handlers. (Larissa Tannus Rebouças a, 2016)

The present cross-sectional study was conducted on 87 food handlers employed in the King Saud University, Riyadh, KSA to evaluate their food safety knowledge, attitude and practices. Present data highlights that most of the workers belonging to different nationalities have good knowledge regarding personal hygiene, food borne diseases and cross contamination related to food safety. The results show that the food handlers had excellent practices towards food and personal hygiene. Attitude is also a crucial factor that influences food safety, food handlers' attitudes were favorable with total of mean scores being 80.76 ± 18.02 and total mean score of 2.69. A significant positive correlation was observed between knowledge with attitudes ($r = 0.371$, $p < 0.05$), knowledge with training ($r = 0.107$, $p < 0.05$), knowledge with personal hygiene ($r = 0.303$, $p < 0.05$), training with personal hygiene ($r = 0.174$, $p < 0.05$) and attitudes with personal hygiene ($r = 0.173$, $p < 0.05$). Although these correlations were positive and significant but the correlation was not very strong. The study suggests that even though the knowledge, attitude and practice level of the food handlers was satisfactory, some of the aspects related to hygiene and time and temperature control need to be stressed. Continuous education and training should be organized to strengthen food handlers' knowledge in areas which seem to be lacking. (Nasser Abdulatif Al-Shabib a, 2016).

8. Role of Food Handlers:

- a) Discussion on the pivotal role of food handlers in ensuring food safety.
- b) Review of international studies assessing food handler knowledge and practices.

9. Study Design:

Cross-sectional analysis using a structured questionnaire.

10. Sampling:

Random selection of restaurant food handlers across different regions in Bangladesh.

11. Data Collection:

- a) Structured questionnaire covering knowledge and practices related to food safety.
- b) Observational assessments of food handling practices.

12. Data Analysis:

- a) Descriptive statistics to summarize knowledge levels and practices.
- b) Subgroup analysis based on demographic factors.

12.1 Demographic Characteristics:

Overview of the study population (age, gender, education, etc.).

12.2 Food Safety Knowledge:

Percentage of correct responses to knowledge-based questions.

12.3 Food Handling Practices:

Evaluation of observed practices during the study.

12.4 Association Analysis:

Correlation between knowledge levels and observed practices.

13. Discussion:

13.1 Interpretation of Findings:

Discussion on the significance of observed knowledge and practice levels.

13.2 Comparison with Previous Studies:

Contrast findings with existing literature on food safety in Bangladesh.

13.3 Implications for Public Health:

Discussion on how improving food safety among restaurant food handlers can positively impact public health.

14. References

- A. Larissa Tannus Rebouças a, L. B. (2016). Food safety knowledge and practices of food handlers, head chefs and managers in hotels' restaurants of Salvador, Brazil. *Food Control*, 1-10.
- B. Nasser Abdulatif Al-Shabib a, *. S. (2016). Cross-sectional study on food safety knowledge, attitude and practices of male food handlers employed in restaurants of King Saud University, Saudi Arabia. *Food Control*, 212-217.

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